

**Salts and permeability to acids.**—BRENNER<sup>13</sup> finds by the use of a deplasmolitic method on red cabbage that neutral salts modify the toxicity of acids. The following table shows the killing concentration of HCl, four hours exposure, following plasmolysis by the various salts:

Plasmolytic agent	Critical conc. of HCl in mols.	H ion conc. of critical sol.
NaCl 2.2 per cent . . . . .	1/1000	$8.91 \times 10^{-4}$
KNO <sub>3</sub> 3.75 per cent . . . . .	1/800	$1.29 \times 10^{-3}$
KCl 2.8 per cent . . . . .	1/600	$1.38 \times 10^{-3}$
K <sub>2</sub> SO <sub>4</sub> 5.0 per cent . . . . .	1/400	$4.68 \times 10^{-4}$
Mg (NO <sub>3</sub> ) <sub>2</sub> +6 aq. 8.8 per cent . . . . .	1/1000	$1.09 \times 10^{-3}$
MgCl <sub>2</sub> +6 aq. 7.0 per cent . . . . .	1/400	$3.16 \times 10^{-3}$
MgSO <sub>4</sub> +7 aq. 16.1 per cent . . . . .	1/250	$1.12 \times 10^{-3}$
Ca(NO <sub>3</sub> ) <sub>2</sub> +4 aq. 6.5 per cent . . . . .	1/500	$1.95 \times 10^{-3}$
CaCl <sub>2</sub> +6 aq. 6.2 per cent . . . . .	1/250	$5.50 \times 10^{-3}$
Dextrose . . . . .	1/700	$8.90 \times 10^{-4}$
Saccharose . . . . .	1/700	$8.71 \times 10^{-4}$

The author emphasizes the fact that salts antagonize the toxic action of strong mineral acid, H ion, just as they have long been known to do with other salts. The antagonistic action of salts toward H ions is due to the joint action of cations and anions of the salts. By change of color in the anthocyanin of the cells used, the author determined that acids enter uninjured cells very slowly, and that the effect of salts in reducing this entrance corresponds to their antitoxic effects. In cells that are killed by acids, NaCl, KCl, and KNO<sub>3</sub> favor the exosmose of anthocyanin, and salts of earth alkali delay it very much. Of the plasmolytic agents Mg salts proved very toxic. In Mg(NO<sub>3</sub>)<sub>2</sub> no cells were alive after twenty-four hours, and in MgCl<sub>2</sub> and MgSO<sub>4</sub> very few. The salts of alkalis were only slightly less toxic, except for KCl, which showed many cells alive after two days. In CaCl<sub>2</sub> the cells would remain alive and plasmolyzed for a much longer time, some of them for twenty-one days. The author emphasizes the toxic action of pure salts and the balanced or non-toxic nature of mixtures of salts.—WM. CROCKER.

**Soil moisture.**—A new classification of soil moisture, based upon its behavior in freezing, appears to be founded upon scientific principles and to give a deeper insight into the actual condition of such water, its movement, and its relationship to plants. BOUYOUCOS<sup>14</sup> has found that a portion of the soil moisture freezes readily near 0°C., another portion only when a temperature of -4°C. is reached, and a third portion does not freeze at all. The first

<sup>13</sup> BRENNER, W., Über die Wirkung von Neutralsalzen auf die Säureresistenz, Permeabilität und Lebensdauer der Protoplasten. Ber. Deutsch Bot. Gesells. 38: 277-285. 1921.

<sup>14</sup> BOUYOUCOS, G., A new classification of soil moisture. Soil Science 11:33-47. 1921.



portion is called "free" water, to distinguish it from the remaining "unfree" water. The portion of the latter capable of being frozen is regarded as capillary-adsorbed, while that which does not freeze at all is the combined water or the water of solid solution and of hydration.

The physiological and ecological significance of such a classification is indicated by showing that a close relationship exists between the unfree water and the wilting coefficient of BRIGGS and SHANTZ, and between the combined water and the hygroscopic coefficient. The new classification, together with the relationship of the different classes of soil moisture to plants, may be concisely expressed as follows, gravitational water being the same as in older systems of classification:

- |                       |   |
|-----------------------|---|
| 1. Gravitational..... | superavailable                            |
| 2. Free.....          | very available                            |
| 3. Unfree {           | Capillary-adsorbed.....slightly available |
| {                     | Combined {                                |
| {                     | water of solid solution                   |
| {                     | water of hydration                        |
| }                     | .....unavailable                          |

The method of measuring the relative amounts of these various forms of water in the soil is known as the dilatometer method, and is relatively simple, being based upon the expansion of water upon freezing. This method would also seem to offer a convenient, rapid, and accurate method of determining the wilting coefficient.—GEO. D. FULLER.

**Nutrients for *Rhizopus*.**—Miss DUNN<sup>15</sup> has studied the effect of various concentrations and proportions of nutrients upon BLAKESLEE's two races (male and female) of *Rhizopus nigricans*. The salts  $\text{KH}_2\text{PO}_4$ ,  $\text{NH}_4\text{NO}_3$ ,  $\text{MgSO}_4$ , and  $\text{FePO}_4$  were used in various proportions, and total concentration with glucose or glycerine as the carbon source. Apparently calcium is not needed by this plant, and it makes no use of nitrate as a nitrogen source, but uses the  $\text{NH}_4$  ion. Under the conditions of this investigation "the activity of the organisms appears clearly to be controlled by a combination of (a) salt proportions (or perhaps ion proportions), (b) total salt concentration, and (c) dextrose concentration. When these three conditions are poorly balanced for the growth of these races, the solution may sometimes be greatly improved by altering just one of the conditions, but it is frequently necessary to alter two conditions simultaneously to obtain good physiological balance. The solution representing the best combination has the following characteristics: (a) Molecular salt proportions:  $\text{KH}_2\text{PO}_4$  6.0: $\text{NH}_4\text{NO}_3$  1.0 :  $\text{MgSO}_4$  1.1 :  $\text{FePO}_4$  a mere trace. (b) Total salt concentration, equivalent to a calculated osmotic value of 14.5 atmospheres. (c) Dextrose concentration, 1.0 gram-mol. per liter." There was no consistent difference in dry weight production between the male and female races when grown on dextrose, but when grown with glycerine as the

<sup>15</sup> DUNN, GRACE A., A comparative study of the two races of *Rhizopus nigricans*. *Physiol. Researches* 2:301-339. 1921.